INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

ANALOG CIRCUITS								
III Semester: EEE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AECD05	**Core**	3	0	0	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: : Electrical Circuits , Linear Algebra and Calculus								

I. COURSE OVERVIEW:
This course provides the knowledge over the principles and construction of analog electronics. It covers the characteristics of electronic devices such as diodes, transistors, operational amplifiers and analysing amplifier circuitsusing small signal model and hybrid pi model, linear and nonlinear wave shaping. It focuses on applications in the area of power electronics, digital electronics and VLSI design.

II. COURSE OBJECTIVES:
The students will try to learn:

I. The operational principles of analog electronic circuits such as feedback amplifiers and operational amplifiers
II. The analog circuits fundamental theory to build signal conversion circuits, filter circuits, Data converters and Automatic Gain Control.
III. The analog circuits applications in the advanced fields power electronics such as power factor monitoring
IV. circuits, power quality measurement, SMPS and battery controls.

III. COURSE OUTCOMES:
After successful completion of the course, students should be able to:

CO1	Recall the principles and operation of pn diode for the applications such as rectifiers, clippers, and clampers.
CO2	Illustrate the characteristics of bipolar and uni polar transistor for operating in different regions of operation.
CO3	Estimate feedback amplifiers parameters based on sampling and mixer circuits.
CO4	Determine frequency of oscillations for the RC, LC, Hartley and Colpitts oscillators.
CO5	Understand the principles and operations of operational amplifier for operating in different regions of operation.
CO6	Utilize inverting and non inverting amplifiers as waveform generators and in IC related real time applications.

IV. COURSE CONTENT:

MODULE - I: SEMICONDUCTOR DEVICES (10)
P-N junction diode, V-I characteristics of a diode, BJT construction, Input output characteristics Common Base, Common Emitter, Common Collector configurations, FET, MOSFET construction, drain and transfer characteristics.

MODULE –II: SEMICONDUCTOR DEVICE APPLICATIONS (09)
P-N diode applications:half-wave and full-wave rectifiers, clippers and clampers, BJT Load line analysis, common emitter, common base and common collector amplifiers; Small signal equivalent circuits.
small signal model of FET, gain, input and output impedances, common-source, common-gate and common-drain amplifiers.

MODULE –III: FEEDBACK AMPLIFIERS AND OSCILLATORS (10)

Concepts of feedback: Classification of feedback amplifiers, general characteristics of negative feedback amplifiers, effect of feedback on amplifier characteristics, voltage series, voltage shunt, current series and current shunt feedback configurations, simple problems.

Oscillators: Condition for Oscillations, RC type Oscillators: RC phase shift and Wien-bridge Oscillators, LC type Oscillators: generalized analysis of LC Oscillators, Hartley and Colpitts oscillators

MODULE – IV: OPERATIONAL AMPLIFIERS (10)

Operational Amplifier: Differential Amplifier, DC and AC analysis of dual input balanced output configuration, dual input unbalanced output. Characteristics of Op-amps, Op-amp block diagram, ideal and practical Op-amp specifications. DC characteristics: Input, output offset voltages and currents, drift. AC characteristics: Frequency response, slew rate, CMRR.

MODULE – V: OPERATIONAL AMPLIFIER APPLICATIONS (09)

Linear applications of Op-amps: Inverting and non-inverting amplifier, integrator, differentiator, instrumentation amplifier. Non-linear applications of Op-Amps: Comparators, monostable and astable multi vibrators, triangular, saw tooth, square wave generators, log and anti-log amplifiers.

V. TEXT BOOKS:

1. Jacob Millman, Christos C Halkias, "Integrated Electronics", McGraw Hill Education, 2nd Edition 2010.
2. Ramakanth A, Gayakwad, "Op-Amps & Linear Ics", PHI, 2003.

VI. REFERENCE BOOKS:

1. Thomas L. Floyd, "Electronic Devices Conventional and Current Version", Pearson, 2013.
2. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
4. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley &Sons, 2001

VII. ELECTRONIC RESOURCES:

1. http://www-mdp.eng.cam.ac.uk/web/library/enginfo/electrical/hong1.pdf
2. https://archive.org/details/ElectronicDevicesCircuits
3. http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASIC ELECTRONICS/home_page.htm
4. www.nptel.ac.in
5. notes.specworld.in/pdc-pulse-and-digital-circuits

VIII. MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open end experiments
5. Definitions and terminology
6. Assignments
7. Model question paper - I
8. Model question paper - II
9. Lecture notes
10. E-learning readiness videos (ELRV)
11. Power point presentation